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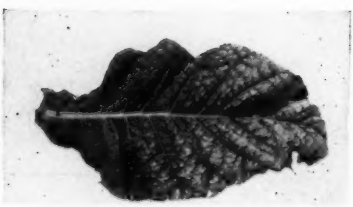
Dec. 1934-Jan. 1935 10 Cents

The Pocket Book of Agriculture

POTASH
Starvation Symptoms

No. 3
of a series



THESE tobacco leaves show progressive deterioration due to potash starvation. The tips of the leaves first show a yellow mottling. This yellow mottling proceeds through the leaf. The leaves become puckered, rough, thick, and brittle. The margins die and dead areas develop, causing "leaf spot" troubles.

A tobacco crop of 1,000 pounds of cured leaf removes from the soil about 80 pounds of actual potash, or the potash in 1,000 pounds of fertilizer containing 8 per cent potash.

The tobacco plant is a shallow feeder that grows to maturity in a very short length of time. For this reason, very often even larger quantities of potash than the plant actually removes from the soil are needed in order that it may get sufficient potash to produce extra yields of high quality.

Potash is the quality-producing element in tobacco fertilizer. It pays to use fertilizer containing plenty of potash to reduce trash, improve body, make smoother leaves, reduce disease, improve price, and increase yields.

Better Crops with PLANT FOOD

The Whole Truth — Not Selected Truth

R. H. STINCHFIELD, *Managing Editor* SID NOBLE, *Editor*

Editorial Offices: 19 West 44th Street, New York

VOLUME XIX NUMBER ELEVEN

TABLE OF CONTENTS, DEC., 1934-JAN., 1935

Hearts and Hopes 3

Jeff Analyzes the Christmas Spirit

Tobacco — The Gold of the Province 7

Valuable New Data, Reported by P. D. Brown

The Inquiring Mind and the Seeing Eye 12

Dr. H. J. Wheeler Is Dr. Alexander's Subject This Time

Editorials 19

Reviews 21

Pastures—Irrigated and Fertilized 27

R. E. Stephenson Describes Their Advantages

Agricultural and Scientific Bureau

N. V. POTASH EXPORT MY., INC.

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Better Crops with PLANT FOOD

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VOL. XIX NEW YORK, DEC., 1934-JAN., 1935 No. 11

Jeff Wishes Us "A Happy New Era!"

Hearts *and* Hopes

By Jeff McDermid

OF all the things which may be said in praise of Christmas, I believe that it is the mutual joys and sorrows which we share, and which at this season we are most conscious of, that surround this ancient holiday with treasured reverence.

We forget that we are identified or labeled with this movement, or that creed or party, in the eyes of the narrow world in which we drive and dream; we lay aside the well-filled bank-book or else the patched garment; we quit posing and planning. We call to mind pictures in our lives, the high-lights and shadows of which are the common lot of mortals. We acknowledge that greater than all economics and deeper than all short-cuts to security are the foundations of human nature, and that until some bond of love cements the universe, there can be no solace in finance, legislation, or organization.

Christmas confessions, that take your friend's hand and lead him back through old incidents, faded remnants

of the memory, which in your past life reach out to kinship with his own experience—such a mood is mellow enough to match the bursting autumn pippins baking on your ruddy hearthstone. And if some recollection resembles the gray ashes beneath the Yuletide embers, that also is part of the reunion. For whether we watch the old year out in farm-house living-room, or pent-house perch, the gates of reminiscence, honestly opened, teach us how much alike we really are despite our "ologies" and "isms."

IT is two or three days before Christmas in 1896. The main trading street of the Midwestern town is lined with bob-sleds and jingle sleighs, whose nags bend their noses before a powdery snow, piled above the gutters and tramped hard with the brown marks of farm shod feet. In and out of the bank they stomp and jostle, in and out of the feed store, crowding up to the postoffice windows, exchanging muffled greetings since it is before the era of the rural free delivery and the sentimental post-card.

The Fair Store in the center of the block draws the most attention, for Woolworth has not yet crowded the local variety shop into do-do land. Smiling, rosy Mrs. Rohmer and her huge and hearty spouse, flanked by a motley crew of extra clerks, wrap packages and jerk traveling cash cages frantically in these days before change was "rung up."

Cautiously, with timid step and staring eyes of wonder, a lad of six steals into the dim aisles, pokes his way past furry overcoated farmers, and wedges himself before the "pretty dish" counter. He has earned a few cents loading cord-wood for a neighbor, and Mother has only a few nice plates left out of her wedding set. Mother really ought to have something better than a new cake plate, he thinks, because her best silk dress was new when Arthur was president, and that darn bonnet of hers is one reason why she never comes to town, even on Christmas week.

"How much are these plates, the ones with purple morning-glories on the edges and the bluejay in the center on a rose bough?"

Mrs. Rohmer's fat niece laughs and says, "Fifteen cents each and the wire handle fits over it for a nickel more."

"Wrap it up and give me a dime's worth of heart candies, some pink and yellow ones, not all just white."

Flushed with his precious purchase, the kid stops and buys two packets of Ole Virginny cheroots out of the blue box with the cottony nigger head on the cover. "Pa's favorite brand, these three-fers. I'll put 'em near his mustache cup for breakfast on Christmas morning."

He opens the door with its funny bell that tinkles customers out as well as in, tucks his brown parcels under his reefer, and waits in the snow for Neighbor Stock to sell his cordwood so they may begin the homeward jaunt over crunching trails. Yes, this is a happy Christmas, and the new cake plate on New Year's Day will hold a spongy raisin loaf, while the fumes of Dad's perfectos will be the only cloud on the horizon of 1897.

EVER since the kid, now long grown into manhood, can remember his Dad asked the blessin' at meal time. When he was pretty young the kid thought his Dad was "reading it off the plate." I guess the blessin' was one his Dad made up himself or had Elder Pitcher fix up for him. It was short—too short for spinach days and too dum long when they had chicken and apple pie. His Pa used to put his hands on the edge of the red-and-white check table cloth, and the kid recalled they shook a little from the palsy left by the consarned fever'n'ague that "Cump" Sherman led his boys into down in the bayous back in the Sixties.

The kid reckoned once that Dad never failed to asked the blessin' from the time the lad was a drooler until he left home for keeps. That meant about twenty-two thousand graces in twenty years, 'cause the old gent wouldn't give up the custom even when he broke his ribs falling off a hay rack, and he was never away from home on long trips.

Came one day long afterward, when the kid was a married man and had children of his own, and his old Dad was in his dotage. It was too hard on Mother to take care of him always and so the two of them decided to enter the war veteran's home. Son went up over Sunday and dolled his Dad up in the shiny blue serge he used to wear on Decoration Day and on campfire nights. He had to pin on all the buttons and emblems and reunion badges of the old Twenty-Second regiment and fasten the G. A. R. braid on his hat—nothing else would do for the great trip. Then Ma set the table with a few scraps left over, and Son bought some ice-cream.

It wasn't an "upper room" and there weren't twelve disciples, but it came over the Son, sudden like, that this was the Last Supper! He almost backed out into the kitchen pretending to look for something, but Ma told Pa to wait—and then—a blurred image of a weak, gray head, bent over a cracked plate: "For the comfort and sustenance of home and food, we ask to be truly grateful, Amen!"

ANOTHER scene—a group of college students who might have been sadly marooned in drab boarding-houses over Christmas, 1912, had it not been for a certain thoughtful old couple of the campus community. A week before the holidays mysterious invitations came to a dozen young men and women, who met for almost the first time around the table at this pleasant home and remained in the cheery companionship of each other and their hosts until late evening. Each found a practical present thrust into his or her pocket at parting, with a note which explained the origin of the unexpected privilege:

"Five years ago we lost a son and daughter in an accident on their return home for the holidays. Since then we have been very lonely, and especially so at Yuletide, when so many thoughts center on family reunions. Instead of crying softly to ourselves over the clothes, schoolbooks, and treasures of our children and hugging our cold misery to avail us nothing, we choose rather to populate our home again for this merry season with the gaiety and the freshness of youth, and preferably youth which also needs the comfort of a home at Christmas."

Every Christmas since 1912 this custom has been repeated with varying groups of home-hungry students, although one of the parents has since joined her loved ones in the Place where there are no heartaches and no partings.

ONE of the joyful, back-slapping brothers of a service club of civic lunch buddies felt it was time to do something for the city besides sing, eat, and erect booster signs. Hence their program at Christmas became less self-centered than selling tires, calico, and store teeth. Each one drove his car to the children's ward of the state hospital. Into each car the brethren packed the victims of inherited weaknesses, the bandaged limbs, the arms held pinioned remorselessly to stiff boards, the twisted faces

and the feeble, lolling heads.

Down to the gaudy theater; another tussle and tag of heaving bodies; the plush seats; the dim lights; the dancers; the fluttering film unfolding its marvels; the pealing concert organ bathed in rainbow rays; little eyes aglow; tiny hands waving in ecstasy; brave stumps in white trying to wave; some tears and much joy! Meanwhile two brothers of the boost remained in the wards, and when the caravan of happy misery returned, there was a fragrant fir tree, garlanded with baubles and jeweled with glowing points of flame; while each bed had its ribboned package, for some of them the first, and for others the last gift that Santa ever tendered.

Somehow the buddies who had kiddies of their own felt this holiday to be more purposeful than any in their lives before, and those who lacked the family favor pledged themselves to be worthy of the honor, and so they all met the New Year with a kindled zest.

HOLIDAYS come to Dakota sodbusters also, even to those who fly from mortgaged farms in Iowa to preemption claims in the wiry grass of far-flung Trans-Missouri lands. Here in the winter of 1908 are a group of merry, homespun mummers, crowded into a neighbor's tar-paper shack house. They are about to call forth the customs of their rural sires, as told to them in stories of Christmas back in New England or in up-state New York. Corn is popping, cider (from the store, bad cess!) is broached, home-made candy is off the fire to cool, and all hands beg Mister Cotter to unlimber the squeaky fiddle so that Money Musk and the Devil's Dream may loosen the stiff limbs of gumbo plowmen. Then the meagre furniture is shoved into the only other room—the kitchen—and couples bow and scrape to reels and squeeze hands in the corners. Outside a coyote slinks upon a frozen hill and yip-yaws to the northern lights.

When the morning shows a dim trace against the eastern prairie rim, and the last shout of good will to man is over, the buckboards wend across the sea of sod to other tiny habitations, where a long winter lurks to prey upon them until the horned larks presage the coming of another spring.

THE suburbanite tackles his length of sidewalk, blanketed in sticky snow, and then leans upon his shovel a few times to rest from unaccustomed heavings. The white doorway is decked with green and red, candles gleam from the two front windows, casting shadows on the bank where April crocusses sleep.

How pleasant it is! How friendly the shelter of the woodsy hills! How comforting the glow from neighbors' homes! How long he has sought this quiet haven! Yet deep in his mind lies the weight of a thinner income, so that he brushes the snowflakes absently and wonders if by another Christmas there will be wolf tracks around his cozy door. Selfishness, perhaps a little, but a common and a pardonable fault. If home becomes to such as him a place of worship, where else may solace be found when hard times tarnish the Yuletide tinsel?

Then suddenly, the door is standing wide, and seeing the Helpmeet there reassures him that he is only the Other Half after all, and that where confidence and loyalty abide, the wolf will lick his chops in vain. Christmas, or any day, is lovely and serene when family trust is well established and its love puts pride to rout, come good or evil, sun or cloud! "For I am persuaded that neither life nor death, nor angels, nor principalities or powers, nor height or breadth, nor any living creature can separate us from the Love of Jesus Christ, our Lord!"

Others with wider experience among the scenes of this world will vision again far fiercer and sterner themes than mine—grim trench

(*Turn to page* 32)

Field demonstration ready for harvesting on the farm of Joseph S. Burch, Port Tobacco, Maryland. The fertilizer used on the left was a 4-8-8; that on the right, a 4-8-12.

Tobacco—The Gold *of the* Province

By P. D. Brown

County Agent and Acting Tobacco Specialist, University of Maryland

CAPTAIN NEALE, (Master of Wollaston Manor): "There my man, before you lies the 2,000 acres of Wollaston Manor and as fair a parcel of land as you will find in the New World. Upon it you will make your home for the next four years and learn the cultivation of the gold of the province."

Phillip Trueman, (Redemptioner): "Did you say gold, Squire?"

Captain Neale: "Well, mayhap not the gold you have in mind, nor yet the pound sterling of our British markets, but none the less, the Gold of the Province of Maryland—Tobacco."

The "Pageant Lady," authoress of the "Magic Weed," portrays how Phillip Trueman and many other Redemptioners paid their passage to the New World 300 years ago by the cultivation of this magic weed; how tobacco was made the legal tender of the colony to pay taxes, fines, land rent, in fact pay for every want of the new settlers.

Tobacco still pays for almost every want of the Southern Maryland farmer. Although not legal tender for taxes, fines, and the like, it remains the legal payment for land rental now as it was in the early days of the Colony.

In those early days perhaps fertilization of Maryland Tobacco was not a problem. The clearing of new lands

for tobacco when the old fields became unproductive, the use of the so-called rest system where weeds were permitted to grow between tobacco crops, or the growing of tobacco in rotation with grain and sod, fairly well maintained yield and quality and thus delayed the necessity for general consideration of the value of fertilizers.

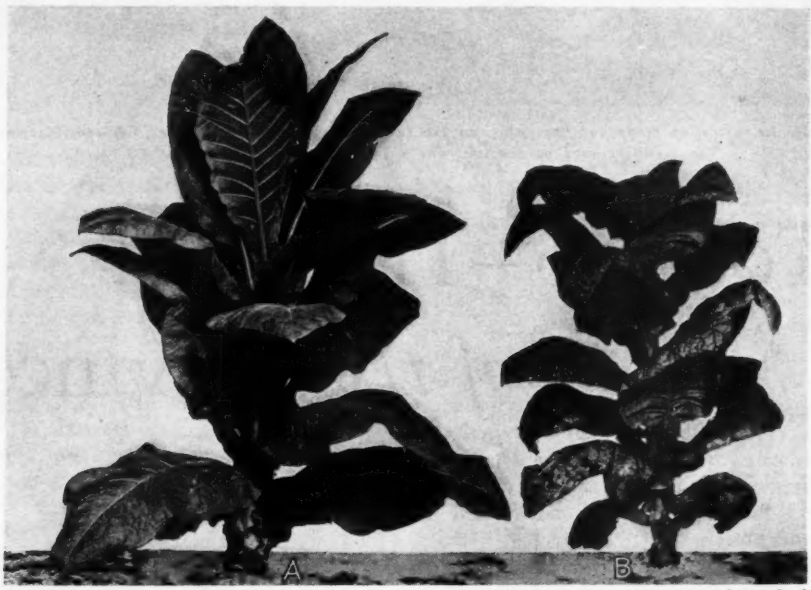
Long since, however, wooded areas have become limited, and in order to maintain yields and quality, fertilizers have become necessary. The increased demand for Maryland Tobacco for cigarettes and the limited area of soils that produce the best quality leaf have accentuated the interest in fertilization, in soils best adapted, and in rotations to supply the necessary organic matter for moisture control and efficient utilization of fertilizer.

Tobacco responds readily to fertilizer applications. It is a short-life crop, seldom remaining in the field more than 90 days. The quickly growing crop invariably has the best quality.

Tobacco has a smaller root system than most farm crops. Because of its rather rapid growth, broad leaf surface, and short life in the field, tobacco is a heavy feeder. It needs an abundance of readily available plant food if it is to make the greatest possible growth.

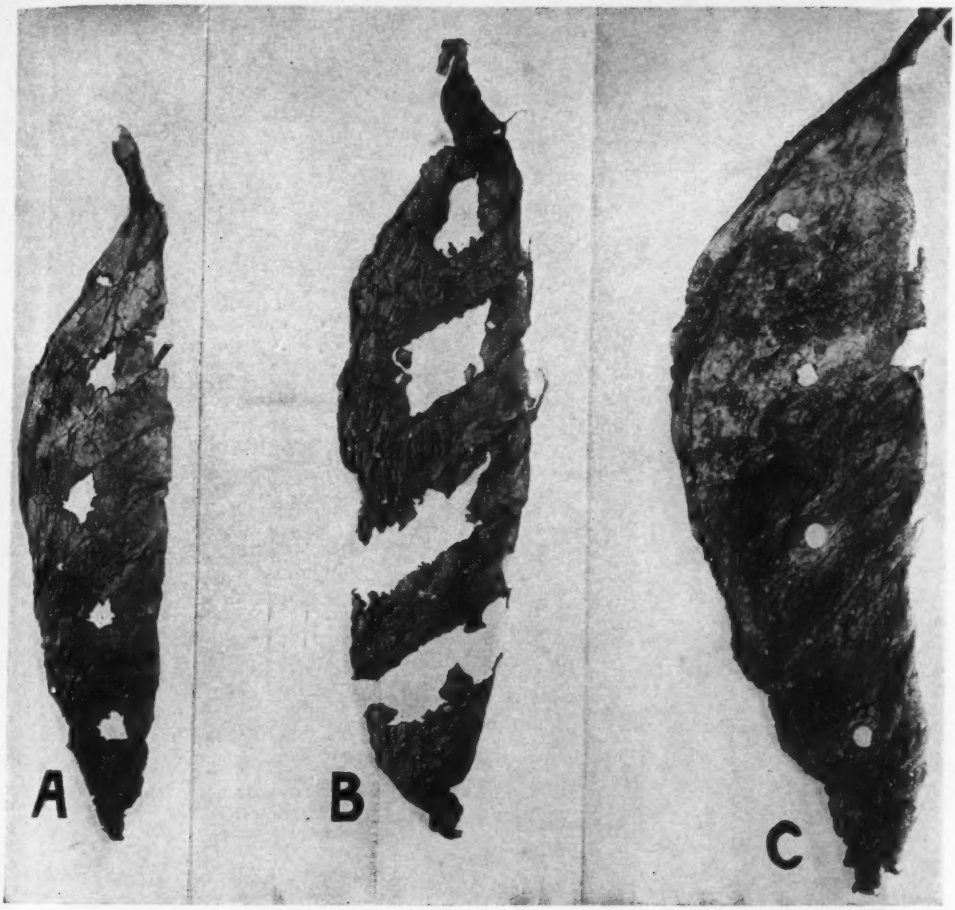
Of the three essential plant-food elements, nitrogen and potash are the most important. An excess of phosphoric acid, when not properly balanced with nitrogen and potash, results in a small yield of light, trashy leaves. Too much nitrogen results in coarse, heavy leaves that cure out dark. Insufficient nitrogen cuts down yield. The object, therefore, in nitrogen fertilization is to use enough to give a vigorous stalk and leaf growth, making sure that enough phosphoric acid and potash are available for a large yield of high-grade leaf.

Quality now plays a more impor-



Cut by Courtesy University of Maryland.

Tobacco plants showing effects of potash on growth: (A), plant grown with a liberal amount of potash supplied in the fertilizer; (B), plant grown with a deficient supply of potash in the fertilizer or in the soil. Note smoothness of leaf in A as compared with necrosis, chlorosis, and drawn appearance of leaves on plant B.



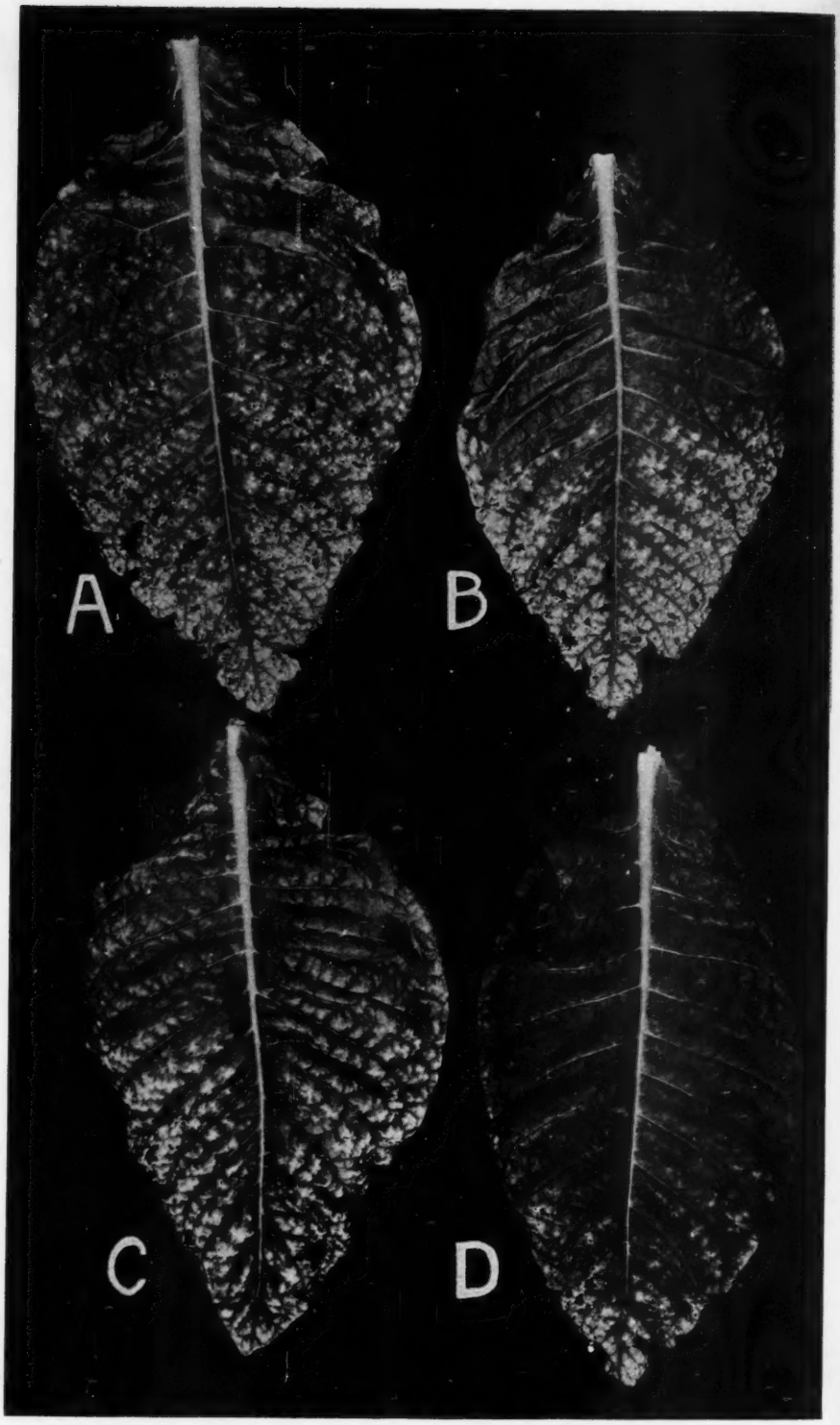
Cut by Courtesy University of Maryland.

Portions of cured leaves illustrating relative uniformity of color and fire-holding capacity (indicated by size of holes burned in leaf when ignited at four points), in relation to potash supply. (A), grown on no-potash treatment; (B), grown with a liberal potash supply, derived from sulphate; (C), grown with liberal potash supply, derived from muriate. The uniform color in (B) and large portion of leaf consumed on ignition are desirable characteristics.

tant role in tobacco growing than ever before. Definite grade standards are being established, and rigid adherence to these standards is being enforced. Difference in prices between grades varies widely from as low as 4 to 6c to as high as 60c per pound, and all gradations in between.

A large proportion of Maryland Tobacco Leaf is used for cigarettes. Leaf which has the desired flavor, aroma, and burning capacity is what constitutes quality in the Maryland market. Buyers, whether at auctions, cooperative or private sale, compete with each other in their eagerness to get such leaf, the result being a high premium for quality.

Many experiments in recent years have been conducted to find out what effect various fertilizers have upon burning quality of tobacco leaf. Fertilizer studies, carefully conducted burning and smoking tests, and chemical analyses all show that burning quality depends upon an abundance



(Legend at bottom of opposite page.)

Cut by Courtesy University of Maryland.

of potash in the leaf and a minimum of chlorine. This has been demonstrated conclusively at the Upper Marlboro Tobacco Experimental Farm, a joint project of the Maryland Experiment Station and the U. S. Department of Agriculture. Results of their long-time studies have been published recently in Bulletin No. 358 of the Maryland Experiment Station.

Summarizing briefly the more pertinent points in the above bulletin, as regards the effect of potash on quality, it is noted:

1. Potash appears to be in some respects the most important component of fertilizer mixtures in the production of quality leaf.
2. Varying the amount of potash did not influence yields so much as quality.
3. The best quality over a period of years was produced when 120 pounds or more of actual potash per acre were applied.
4. When sulphate and muriate forms of potash were compared the results on quality and value per acre were greatly favored by sulphate of potash.
5. Muriate is an undesirable source of potash for Maryland Tobacco.
6. Potash in excess of 120 pounds per acre is justified where leaf spot diseases are common and is good insurance against such disease.

The best tobacco soils of Southern Maryland (sand loams and clay loams that contain at least 20 per cent sand) are notably deficient in potash. This has been revealed by chemical tests as well as by actual field experiments where varying amounts of potash have been applied and results recorded. Whether on the Tobacco Experiment Farm at Upper Marlboro, in field tests by County Agents, or trials by individual farmers, the story has been the same. Potash has been the one element which has the most influence on quality, price per pound, and net income.

Farmers seldom read bulletins as much as they should. Realizing this, the Maryland Extension Tobacco Specialist, working through the five County Agents, in 1926 undertook to take the results of research directly to tobacco growers by means of field demonstrations. In approaching this problem, two types of demonstrations were employed, namely, potash variation and rate of application tests. All treatments were run in duplicate.

In the potash variation tests, fertilizers carrying 4 per cent nitrogen and 8 per cent phosphorus constituted the basic analyses, the rate of application employed being 800 pounds per acre. In this series potash was varied in steps of 4 per cent from 0 to 20 per cent. The results of the 1933 potash variation test on the farm of Joseph S. Burch, Port Tobacco, Maryland, are shown (Table I).

(*Turn to page* 24)

Table I—POTASH VARIATION TEST—1933

Joe Burch, La Plata, Maryland

Fertilizer Analysis	Yield per Acre Lbs.	Price per Pound Cents	Value per Acre Dollars
4-8-8	1141	15.9	181.42
4-8-12	1131	16.2	183.22
4-8-16	1225	15.9	194.77
4-8-20	1452	18.4	267.16

(See illustration on opposite page.)

Tobacco leaves illustrating types of chlorosis resulting from potash deficiency. A-D, leaves showing chlorosis and ragged appearance as a result of potash deficiency.

The Inquiring Mind *and the* Seeing Eye

By Dr. A. S. Alexander

University of Wisconsin

EXPERIENCE, 'tis said, is the mother of science. One usually finds it forming a firm foundation in the equipment of a successful scientist like Dr. H. J. Wheeler, who from 1889 to 1912 was intimately associated with the Rhode Island Agricultural Experiment Station as chemist and research worker.

The earliest experience of the agricultural scientist-to-be is generally acquired on the farm, and in pioneer days was earned by the sweat of the brow, privation in some instances, and always with extremely hard labor. It was in Massachusetts that Dr. Wheeler learned his first lessons in agriculture. In his boyhood days on the farm he was inquiring earnestly into the mysteries of the soil, plant growth, and the wonders of nature spread before him on every hand, and today that study is to him as entrancing and engaging as ever.

Interested in Seaweeds

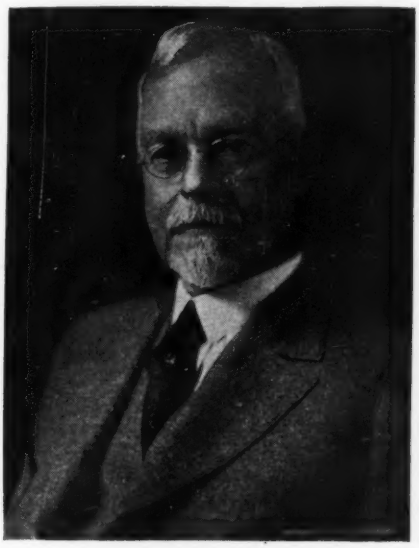
When he became chemist of the Rhode Island Agricultural Experiment Station Dr. Wheeler, with the able assistance of Dr. B. L. Hartwell, studied as a new experience the fertilizing value of the seaweeds cast up by the billows of the Atlantic on the seagirt farms of the State. He knew that farmers there had for generations fertilized their lands with seaweeds to produce larger and cleaner crops of potatoes and he determined to find out just why this soil "sea-food" had been so highly esteemed. The results of the exhaustive study then painstakingly made were published in an illustrated Bulletin No. 21 in January 1893. It included analyses of the various kinds of seaweeds commonly in use on Rhode Island fields as a source of both potash and nitrogen. Later Dr. Wheeler saw the use of bulky seaweeds rendered practically unnecessary by the introduction and dissemination of the artificial fertilizers he analyzed and helped to make popular. Indeed, he made the proper and profitable utilization of these new plant foods his life study and familiarized himself with the subject in a most masterly way.

A Radical Discovery

Dr. Wheeler was, undoubtedly, the first investigator in Rhode Island to show that even upland soils there were in such an "acid" condition that certain crops could not grow satisfactorily on them. This, according to Dr. Hartwell, was considered such a radical discovery that his contemporary research workers thought it could not be the case on other than a very exceptional soil in the State.

Today we find the Rhode Island scientist as interested as ever in this subject of soil acidity and as anxious

to have it clearly and properly understood by farmers. To that end he began in the columns of *The Rural New Yorker* of October 13, 1934, a series of articles on "The (Optimum) Soil, Reactions (pH Values) for the Growth of Different Plants." In the introduction to the series he says: "So-called 'sour' soils are now generally re-



DR. H. J. WHEELER

ferred to as acid—it means the same thing. The term 'pH Value' is now generally used in discussing acid, neutral, or alkaline (sweet) soils. Those having a pH Value of 7 are neither acid nor alkaline (the reverse of acid). If they range from slightly above 7 to 7.5 or 8, they are slightly to moderately alkaline, and if from 8 to 9 or higher they are moderately to very alkaline. A soil with a pH value rating just under 7 and down to 6 is slightly to moderately acid; if ranging from pH 6 down to pH 5, it is moderately to strongly acid; if it ranges from a little below 5 to 4, it is very acid; and if much below 4, it is extremely acid. Soils seldom react to below 3.5 to 3."

He states further that manure is first alkaline but later may have an acid effect. Fertilizers containing sodium and calcium nitrates make soils less acid, and those having most of their nitrogen in sulphate of ammonia make them materially more acid. If lime is needed to raise the pH value to a point favorable to the particular kind of plant to be grown, it should be applied without further delay in order to prevent greatly decreased yields. In some cases even plants of the same genus vary somewhat in their lime requirements as is shown by the different varieties of roses, lupines, strawberries, pines, and many other plants. Certain plants that on very acid soil would respond to heavy liming, were it not for a certain disease, must be limed at a light rate, whereas even heavier liming of other plants on the same soil may lessen the injury from another disease. In other cases too heavy liming causes a discoloration and unhealthy condition of plants due to the effect of the lime in rendering such elements as iron and manganese, which are essential to health and vigorous growth, so insoluble that the plants cannot take up enough of them.

The A. B. C.'s of Liming

In order to help farmers use lime wisely, Dr. Wheeler has hit upon the novel idea of suggesting in the series mentioned a new "A.B.C." on the subject. It gives the approximate pH values of soils that are usually considered best for the different kinds of plants, beginning with alfalfa, regarding which the author says: *ALFALFA.* "A survey of 200 Swedish farms has shown that alfalfa grew best where the pH value was between 7 and 7.5. As the pH value dropped from 7 to 4.5 there was a continual decrease in growth. At pH 4.5 and lower it is practically impossible to establish alfalfa. Another Swedish authority gives pH 6.5 to 7 as best for this crop. This agrees with American experience." Asparagus, Asters, Azaleas,

Apples, etc., follow in alphabetical order.

Dr. Wheeler very early became associated with the field experiments in agronomy at the Rhode Island Station and brought to bear not only a chemical attack but a plant physiological attack upon the problems. The combination of pot experiments and chemical laboratory has continued in close cooperation to this day and has had a potent influence on the value of the field experiments leading to the fundamental explanations of many of the problems. His long interest in soils and fertilizers holds him to his readings on the subject, but he has not committed himself to his closest friends as to what he intends to do with his findings. Perhaps he has considered the series he began in October 1934 in the columns of the agricultural paper, already mentioned, as a fitting outlet for the results of his experience and scientific research work in order quickly and directly to benefit the farmers of the Eastern States.

Work Was Varied

One of Dr. Wheeler's earliest contributions to agricultural science literature was a bulletin for the Rhode Island Experiment Station on the feeding of live stock which gave the then latest ideas on the subject. He was influential in securing laws for the inspection of fertilizers and feeding stuffs which proved so satisfactory that the station has been charged with this service as a non-research activity to this day.

In his experiments relative to the nutritive value of various feeds for live stock we do not find that he tried out seaweeds as a food for animals. In this connection readers in the corn belt and other sections far from the ocean may be interested to learn that in Scotland, Ireland, and Norway cattle sometimes may be seen browsing on seaweeds at low tide. In these countries some varieties of seaweed are used also as food for man. Dr. Wheeler tells us that the people of Rhode Island are familiar with the Irish or Carrageen moss and the dish known as *blanc mange*, which is prepared from it is considered a delicacy. We are not aware that seaweeds have been fed to farm animals in America, the abundance of more palatable and nutritious fodders no doubt having made that unnecessary.

In the varied lines of chemical research work undertaken from 1889 to 1912 at the Rhode Island Experiment Station, Dr. Wheeler had, in addition to that of Dr. Hartwell who succeeded him as Director in the latter year, the cooperation of many other eminent scientists. Of these we find the names of C. L. Sergeant, A. W. Bosworth, G. E. Adams, J. A. Warning, B. E. Brown, J. C. Hogenson, F. R. Pember and others recurring in his publications. While his chief work concerned fertilizer and feeding stuff analyses, the numerous bulletins issued by himself and his assistants show that he also conducted experimental research regarding potato scab, lime and liming, nitrogen for grass, treatment of sandy soils, top-dressing of grass, rotations for various crops, rations for dairy cows, value of sodium salts, soil treatment in greenhouse culture, potato culture, alfalfa culture, continuous corn culture, tests of nine phosphates, effect of nitrogenous manures, and field tests on individual farms.

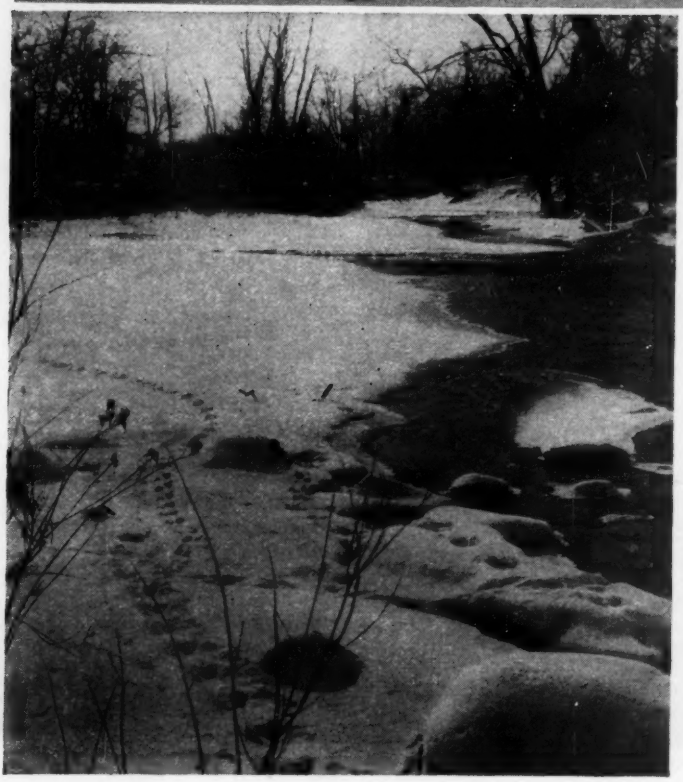
A Voluminous Writer

Dr. Wheeler has been a voluminous writer of papers on agricultural subjects for the Annual Report of the State Board of Agriculture, the United States Department of Agriculture, the American Society of Agronomy, and many other associations, newspapers, etc. Some of the subjects treated include wastes of the farm, commercial fertilizers and home manures, soda and potash, an apparatus for determining fat, requirements and improvement of soil, the agricultural use of lime, acid

(*Turn to page* 29)

Pictorial

THE PLEASURE OF INSIDE WORK.



Above: Getting ready to enjoy a winter afternoon.

Left: Mute evidence of a recent traveler.

Right: Scene near Lake Charles, Louisiana.

Below: The river yields to Old Man Winter.

Above: A surprise for Daddy.

Left: Holy Smokes — Yeow—ow.

The Editors Talk

Our Changing Agriculture

The crisis through which American agriculture is passing is giving a new direction to agricultural activity. The crisis is emphasizing the social as well as the economic phases of the problem; it is giving a new direction to agricultural research towards problems of distribution as well as production and towards a more vital spirit of cooperation, not only between farmers themselves but between farmers as groups and government agencies. If these larger aspects of our newer outlook can be permanently achieved, then the depression may not have been in vain.

These changing aspects of agriculture are brought out well in the annual report of the Secretary of Agriculture. The social aspects are emphasized. For instance in discussing the land-utilization policy, the Secretary notes that it is "a social as well as an economic problem. It involves human beings as well as land." Again speaking of new paths in agricultural research that will join economic science to production science the report notes that as we move away from ruthless competition towards efficient social cooperation, the scope and need for such research increase.

But while a more stable social and economic life on the farm and a broader type of research looking towards these ends are ideals to be sought after, what is to be decided about the many problems which must be met to attain these ideals? The report discusses them fully. Of outstanding importance is the attainment of a "balanced abundance." The policy of further restricting domestic consumption along the lines of "scarcity economics" is declared to be of doubtful wisdom. As pointed out the problem is to retain fair and reasonable profits without falling into the pit of "scarcity economics." "Now that farmers enjoy powers which are fairly comparable with those of city industries with respect to production and price control, it becomes necessary for all of us to spend more time thinking about the road to 'balanced abundance' instead of 'competition for profits induced by scarcity.'"

Another problem is maintaining the volume of agricultural exports. The Secretary notes that from 1921 to 1930 this country exported more than 13% of its farm production, which constituted about one-third of its total exports. But since 1929 our farm export trade has declined nearly 60%. "The advantage to the American farmer of enabling Europe to buy here once more would be enormous." The reasons why there would be no countervailing penalties upon industries by the admission of foreign goods into the American market are discussed. It is pointed out that, the admission of foreign goods, since it would be accompanied by an increase in the purchasing power of the farmers, would handicap industry far less than the alternative policy of enforced farm contraction would handicap agriculture.

Among other problems are the forests' capacity to furnish employment; the land-utilization policy; part-time nonfarm work; the shift to grass and forage; new paths in agricultural research; and the need for continued cotton adjust-

ment. As a note of progress it is observed that, in part due to the three types of Federal aid now in operation, farm income including rental and benefit payments, has risen to $6,000,000,000 for 1934 as compared with $5,051,000,000 in 1933, and $4,328,000,000 in 1932.

The ideals of a "balanced abundance" and more secure social and economic conditions on the farm are indeed worthy ideals. Decisions must be made that may well affect agricultural and national life for generations to come. Many of the problems have technical aspects difficult for us all to understand. Not everyone will agree on the ways and means. But a desire to understand and the cooperative spirit are two things that the most humble among us can give towards a better agricultural and national life.

The Weather of 1935

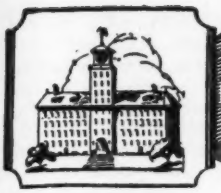
What can we look for in the way of weather in 1935? Will there be another drought? Need farmers in badly stricken areas last year despairingly thumb the attractive seed catalogs which will soon be going through the mails and feel, "Oh, what's the use?"

According to W. R. Gregg, Chief of Weather Bureau of the United States Department of Agriculture, hopes may be as strong next spring as in any other year. While the most outstanding weather event of 1934 was the unprecedented drought that began in the early spring and spread rapidly westward there is nothing to indicate, he says, that this drought constitutes a permanent change to desert-like conditions in a large part of the United States. Present moisture conditions, he admits, are quite unlike those of many centuries ago, but no marked permanent change in precipitation has occurred within the last few years. On the contrary, judging by the longest rainfall records available, the 1934 drought was only what is naturally to be expected at intervals of 30 to 40 years.

Weather forecasts for any considerable length of time, of course, cannot be made with any great degree of accuracy. However, the Weather Bureau this past year paved the way for more accurate forecasts and forecasts of somewhat longer range. With the wider use of modern "working tools," such as radio and airplanes, Mr. Gregg says, the Bureau now stands on the threshold of an era of real progress in forecasting.

Hope for such progress, according to him, centers around the introduction of air mass analysis, the latest aid in forecasting the weather. Three objectives were sought in adopting this system to practical use—(1) training of forecasters in the use of the new method; (2) more frequent, more detailed, and better established observations of atmospheric conditions up to three or four miles above the earth; and (3) more frequent and more detailed reports of surface conditions, including observations at sea.

It is difficult to conceive the great benefit to mankind in the saving of human and animal life and of material goods if the forecasting of weather can, as it undoubtedly will some day, be worked out with accuracy and for some appreciable time ahead. Personal convenience alone should interest everyone in the progress which the Weather Bureau is making toward that end. We hope that 1935 will prove another outstanding year in its research and in the enlargement of its service.



REVIEWS

This section contains a short review of some of the most practical and important bulletins, and lists all recent publications of the United States Department of Agriculture and the State Experiment Stations relating to Fertilizers, Soils, Crops, and Economics. A file of this department of BETTER CROPS WITH PLANT FOOD would provide a complete index covering all publications from these sources on the particular subjects named.

Fertilizers

"Fertilizer Experiments with Pecans" by G. H. Blackmon and R. W. Ruprecht of Florida presents data from considerable work with this increasingly important nut crop. Several varieties in orchards in numerous localities were fertilized with varying amounts of different fertilizer analyses. The influence of these fertilizers on the growth and yield of the trees and the size and composition of the nuts was determined. The data are too numerous to be considered here in detail. In general, however, a complete fertilizer was found to be far superior to no fertilizer, or to an incomplete fertilizer, so far as yields and tree growth were concerned. The best analyses and amount of fertilizer varied with the soil and variety of nut grown. Fertilizers did not seem to have much influence on the composition of the nuts during the course of these experiments. Definite information on the fertilizing of pecan trees is rather meagre and pecan growers will welcome these results published as Bulletin 270 of the Florida Agricultural Experiment Station.

The Fertilizer Control Reports of the various States are too numerous for all to be given individual review in these columns, but they contain much interesting and informative material. Unfortunately the data contained in these bulletins are not uniform among the States. In some cases the results of the fertilizer analyses are merely listed. In other cases these listings are reduced to a minimum and much more valuable data on tonnages of various fertilizers and plant-food consumption are given. A good example of this type of report is Purdue University Agricultural Experiment Station Circular 202 "Commercial Fertilizers" by H. R. Kraybill and his co-workers. It is interesting to note that fertilizer tonnage and plant-food consumption increased in 1933 over 1932. However, the tonnages still are only about half of what they were during the 20's. Significant and marked changes in the relative proportions of plant food consumed during the last 14 years are shown. The fertilizers on the average are more concentrated than formerly and contain more of all three plant nutrients. Nitrogen and potash have increased relatively more than phosphoric acid. Many other interesting tables on fertilizer consumption in Indiana are given in the bulletin.

"Fertilizers for Arizona Soils," Agr. Exp. Sta., Tucson, Ariz., Ext. Cir. 80, *Oct.* 1933, *W. T. McGeorge.*

"Quarterly Bulletin," State Bd. of Agr., Dover, Del., Vol. 24, *No.* 2, *June* 30, 1934.

"Effect of Frequent Cutting and Nitrate Fertilization on the Growth Behavior and Relative Composition of Pasture Grasses," Agr. Exp. Sta., Gainesville, Fla., Bul. 269, *July*, 1934, *W. A. Leukel, J. P. Camp, and J. M. Coleman.*

"A Study of Ammonia and Nitrate Nitrogen for Cotton," Agr. Exp. Sta., Experiment, Ga., Bul. 182, *May*, 1934, *K. T. Holley, T. G. Dulin, and T. A. Pickett.*

"Analyses of Commercial Fertilizers," Agr. Exp. Sta., Lexington, Ky., Bul. 336, *Dec.* 1932, *H. E. Curtis, H. R. Allen, and Lelah Gault.*

"A Study of the Effect of Certain Ammonium Compounds on the Soil and on the Crop," Agr. Exp. Sta., New Brunswick, N. J., Bul. 571, June 1934, A. L. Prince and A. W. Blair.

"Winter Injury of Baldwin Apple Trees and Its Relation to Previous Tree Performance and Nutritional Treatment," Agr. Exp. Sta., Geneva, N. Y., Bul. 647, July 1934, R. C. Collison and J. D. Harlan.

"Commercial Fertilizers," Agr. Exp. Sta., Burlington, Vt., Bul. 381, July 1934, L. S. Walker and E. F. Boyce.

"Tomato Fertilization—II. The Effect of Different Fertilizer Ratios on the Chemical Composition of Tomatoes," Va. Truck Exp. Sta., Norfolk, Va., Bul. 81, Oct. 1, 1933, R. L. Carolus.

"Nitrogen in Relation to Composition, Growth, and Yield of Wheat," Agr. Exp. Sta., Pullman, Wash., Bul. 296, May 1934, L. D. Doneen.

Soils

Practical suggestions on how to handle sandy soils so as to make the best use of them are contained in Michigan Agricultural Experiment Station Special Bulletin 248 entitled "Sandy Soils" by G. M. Granthamand C. E. Millar. Factors to be considered in determining whether or not to farm a soil at all are briefly given, but most attention is paid to methods of improving those sandy soils worthy of being cultivated. The great importance of organic matter is stressed, the necessity of lime on many of the soils is brought out, and the value of complete fertilizers in producing profitable yields is shown. The growing of adapted crops, crop rotations, and tillage practices also are given. When sandy soils are properly handled, remarkable improvement in yield and quality of crops is produced by correct fertilization. The authors deserve much credit for showing what can be done under actual field conditions on these soils in the profitable production of crops. The bulletin naturally is prepared primarily for Michigan conditions, but the principles underlying sandy soil management given will apply to nearly all such soils.

"Soils and Crops of the Imperial Valley," Agr. Exp. Sta., Berkeley, Calif., Cir. 334, June 1934, Stanley W. Cosby and L. Gordon Goar.

"Soils in Relation to Fruit Growing in New York—Part IV. The Significance of the Oxidation-Reduction Potential in Evaluating Soils for Orchard Purposes," Agr. Exp. Sta., Ithaca, N. Y., Bul. 592, Apr. 1934, Richard Bradfield, L. P. Batjer, and Joseph Oskamp.

"Soils in Relation to Fruit Growing in New York—Part V. The Vineyard Soils of the Westfield Area, Chautauqua County," Agr. Exp. Sta., Ithaca, N. Y., Bul. 609, June 1934, Joseph Oskamp.

"Liming Western Oregon Soils," Agr. Exp. Sta., Corvallis, Ore., Bul. 325, June 1934, R. E. Stephenson and W. L. Powers.

"Need and Use of Lime on Vermont Soils," Agr. Exp. Sta., Burlington, Vt., Bul. 371, Apr. 1934, A. R. Midgley and V. L. Weiser.

"Studies in Tolerance of New England Forest Trees—XI. The Influence of Soil Temperature on the Germination and Development of White Pine Seedlings," Agr. Exp. Sta., Burlington, Vt., Bul. 379, June 1934, W. R. Adams.

"Soil Survey of Frio County, Texas," U. S. D. A., Washington, D. C., Series 1929, No. 25, M. W. Beck, H. W. Hawker, and L. G. Ragsdale.

"Soil Survey (Reconnaissance) of The Trans-Pecos Area, Texas," U. S. D. A., Washington, D. C., Series 1928, No. 35, W. T. Carter, M. W. Beck, H. M. Smith, H. W. Hawker, E. H. Templin and T. C. Reitch.

"Soil Survey (Reconnaissance) of The Columbia Basin Area, Washington," U. S. D. A., Washington, D. C., Series 1929, No. 28, A. T. Strahorn, E. J. Carpenter, W. W. Weir, Scott Ewing, H. H. Krusekopf, A. F. Heck, and H. A. Lunt.

Crops

One of the most complete treatises of an important crop to be recently published is Bulletin 364 "Tobacco Culture in Connecticut." In this publication, Dr. P. J. Anderson, in charge of the Tobacco Substation at Windsor, Connecticut, has clearly brought up to date many years of observation and research work on the profitable growing of tobacco in this New England State. The subject matter is inclusive. Beginning with an introduction outlining the development of the crop from 1640, the author treats of varieties, acreage and distribution, types of soil suitable for tobacco, and seed beds. Much work has been done in this State on the fertilization of this crop and this is well

summarized. Other important problems discussed include setting the plants, cultivation, topping and suckering, harvesting, curing, taking down, stripping and bundling, cover crops, diseases, and insect pests. This bulletin surely will be much sought after by everyone interested in any phase of tobacco production.

"Plant Association and Survival, and the Build-Up of Moisture in Semi-Arid Soils," Agr. Exp. Sta., Tucson, Ariz., Tech. Bul. No. 53, June 15, 1934, J. F. Breazeale and F. J. Crider.

"Grapefruit in Maricopa County—Response of Young Trees to Environment and Practices," Agr. Exp. Sta., Tucson, Ariz., Ext. Cir. 77, Apr. 1933, George W. Barr, Reuben M. Hess, and J. H. O'Dell.

"Growing and Handling Market Peas in California," Agr. Exp. Sta., Berkeley, Calif., Ext. Cir. 85, Apr. 1934, Parker Talbot and A. A. Tavernetti.

"Annual Report for the Fiscal Year Ending June 30, 1933," Agr. Exp. Sta., Gainesville, Fla., Wilmon Newell.

"Dead Grapefruit Refuse—A Valuable Feed," Agr. Exp. Sta., Gainesville, Fla., Press Bul. 466, Oct. 1934, W. M. Neal, R. B. Becker and P. T. Dix Arnold.

"Science Aids Idaho Farmers," Agr. Exp. Sta., Moscow, Idaho, Bul. 205, May 1934, E. J. Iddings.

"Report of Moses Fell Annex Farm, Bedford, Indiana," Agr. Exp. Sta., Lafayette, Ind., Cir. 203, June 1934, H. J. Reed and H. G. Hall.

"Sudan Grass," Agr. Exp. Sta., Lafayette, Ind., Leaflet No. 188, Apr. 1934, R. R. Mulvey.

"Fory-sixth Annual Report of the Agricultural Experiment Station of the University of Kentucky for the Year 1933," Agr. Exp. Sta., Lexington, Ky., Thomas P. Cooper.

"Corn and Soybean Production," Agr. Exp. Sta., Baton Rouge, La., Bul. 253, July 1934, Harold T. Barr.

"Effect of Size of Seed Piece of Irish Potato on Recovery from Freeze Injury," Agr. Exp. Sta., Baton Rouge, La., Bul. 254, Sept. 1934, W. D. Kimbrough and David Costa.

"Growing Fall Irish Potatoes," Agr. Exp. Sta., Baton Rouge, La., Cir. 11, Aug. 1934, W. D. Kimbrough.

"Sudan Grass for Hay and Pasture," Agr. Exp. Sta., College Park, Md., Ext. Cir. 107, May 1934, F. W. Oldenburg.

"Duluth Vegetable Crops: Up to Now—Summary of Annual Report of the Northeast Exp. Sta., Univ. of Minn. for the year 1933," Agr. Exp. Sta., Duluth, Minn., Feb. 1934, M. J. Thompson.

"Arrowhead Vegetables: Varieties and Fertilizers," Northeast Exp. Sta., Duluth, Minn., Mar. 1932, M. J. Thompson.

"A Compilation of Experimental and Other Data on Winter Legumes," Agr. Exp. Sta., State College, Miss., Bul. 303, Aug. 1934.

"The Family Garden," Agr. Exp. Sta., Columbia, Mo., Ext. Cir. 311, Feb. 1934, J. W. C. Anderson.

"Good Pasture Practice," Agr. Exp. Sta., Columbia, Mo., Ext. Cir. 313, Mar. 1934, C. A. Helm.

"Establishing Permanent Pastures in Missouri," Agr. Exp. Sta., Columbia, Mo., Ext. Cir. 314, Mar. 1934, C. A. Helm and H. H. Krusekopf.

"Potato Growing in New Hampshire," Agr. Exp. Sta., Durham, N. H., Ext. Bul. 45, Apr. 1934.

"Fifty-third and Fifty-fourth Annual Reports of the New Jersey State Agricultural Experiment Station and the Forty-fifth and Forty-sixth Annual Reports of the New Jersey Agricultural College Experiment Station for the 2-year Period Ending June 30, 1933," Agr. Exp. Sta., New Brunswick, N. J.

"Cotton Breeding Investigations, 1928 to 1932," Agr. Exp. Sta., State College, N. M., Bul. 217, Jan. 1934, G. N. Stroman.

"Narcissus for Garden and Home," Agr. Exp. Sta., New Brunswick, N. J., Ext. Bul. 119, May 1934, H. M. Biekart.

"Pear Growing in New York," Agr. Exp. Sta., Geneva, N. Y., Cir. 146, July 1, 1934.

"Spinach Production," Agr. Exp. Sta., Ithaca, N. Y., Ext. Bul. 282, Apr. 1934, F. O. Underwood.

"Physiological and Chemical Changes in Carrots During Growth and Storage," Agr. Exp. Sta., Ithaca, N. Y., Mem. 161, Apr. 1934, Hans Platenius.

"Vegetative and Reproductive Responses Associated with Fruit Development in the Cucumber," Agr. Exp. Sta., Ithaca, N. Y., Mem. 163, June 1934, John P. McCollum.

"The Bimonthly Bulletin," Agr. Exp. Sta., Wooster, Ohio, Vol. XIX, No. 171, Nov.-Dec. 1934.

"Putting Green Grasses and Their Management," Agr. Exp. Sta., Kingston, R. I., Bul. 245, July 1934, H. F. A. North and T. E. Odland.

"The Production of Spring Vegetables in the Lower Rio Grande Valley," Agr. Exp. Sta., College Sta., Tex., Cir. 72, Sept. 1934, W. H. Friend and S. W. Clark.

"Forage Sorghums in Texas," Agr. Exp. Sta., College Sta., Tex., Bul. 496, Oct. 1934, J. R. Quinby, J. C. Stephens, R. E. Karper, and D. L. Jones.

"Shortening the Rest Period of the Potato," U. S. D. A., Washington, D. C., Tech. Bul. 415, July 1934, William Stuart and E. H. Milstead.

"The Feeding Value of Artificially Dried Young Grass. III," Agr. Exp. Sta., Burlington, Vt., Bul. 368, Mar. 1934, O. M. Camburn.

"Forty-seventh Annual Report, 1933-1934," Agr. Exp. Sta., Burlington, Vt., Bul. 380, July 1934, J. L. Hills.

"Department of Agriculture-Immigration of Virginia," Richmond, Va., Bul. 321, Nov. 1934.

"Our Changing Agriculture Served by Science," Agr. Exp. Sta., Madison, Wis., Bul. 428, June 1934, Chris L. Christensen.

"Wisconsin Farming Under Adjustment," Agr. Exp. Sta., Madison, Wis., Ext. Cir., 269, May 1934, Chris L. Christensen.

Economics

"Prospects for Agricultural Recovery—VII. Requirements for Economic Plans Affecting Agriculture," Agr. Exp. Sta., Ames, Iowa, Bul. 316, July 1934, John A. Hopkins, Jr.

"Prospects for Agricultural Recovery—VIII. Who Pays for the Hog Reduction Program?" Agr. Exp. Sta., Ames, Iowa, Bul. 317, July 1934, Geoffrey Shepherd.

"The Destination of Iowa's Commercial Corn," Agr. Exp. Sta., Ames, Iowa, Bul. 318, June 1934, Ronald C. Bentley.

"Methods Used in an Economic Study of Land Utilization in Tompkins County, New York, and in Other Similar Studies in New York," Agr. Exp. Sta., Ithaca, N. Y., Mem. 160, Apr. 1934, A. B. Lewis.

"An Economic Study of Grape Farms in Eastern United States—Part I. Production," Agr. Exp. Sta., Ithaca, N. Y., Bul. 605, May 1934, G. P. Scoville.

"An Economic Study of Farms in the Spring Wheat Area of South Dakota," Agr. Exp. Sta., Brookings, S. D., Cir. 19, May 1934, C. M. Hampson and Poul Christophersen.

"Estimated Returns from Farms of Large, Medium, and Small Size of Business in the Spring Wheat Area of South Dakota," Agr. Exp. Sta., Brookings, S. D., Cir. 20, May 1934, C. M. Hampson and Poul Christophersen.

"Estimated Returns from Operating 800 Acres in the Spring Wheat Area Under Four Different Plans," Agr. Exp. Sta., Brookings, S. D., Cir. 21, May 1934, C. M. Hampson and Poul Christophersen.

"The Economics of Certified Seed Potato Production—I. The Seed Potato Enterprise," Agr. Exp. Sta., Burlington, Vt., Bul. 370, June 1934, John A. Hitchcock.

"Studies in Vermont Dairy Farming—VIII. Orleans, St. Albans, Randolph, and Richmond Areas," Agr. Exp. Sta., Burlington, Vt., Bul. 376, June 1934, S. W. Williams.

"Trends in Agriculture in Washington 1900 to 1930—Types of Farming Series, Part II," Agr. Exp. Sta., Pullman, Wash., Bul. 300, June 1934, Neil W. Johnson and Rex E. Willard.

"Nature and Distribution of Types of Farming in Washington—Types of Farming Series, Part III," Agr. Exp. Sta., Pullman, Wash., Bul. 301, July 1934, Neil W. Johnson and Rex E. Willard.

Tobacco—The Gold of the Province

(*From page* 11)

In the rate of application test, the analyses used in three separate series were 4-8-7, 4-8-10, and 4-8-12. Walters Brothers of Hughesville, Maryland, conducted the 1931 test in Charles county, and here are their results (Table II).

The combined summary of the tests

Table II—RATE OF APPLICATION TESTS—1931
Walters Brothers, Hughesville, Maryland

Plot No.	Rate per Acre	Yield per Acre Pounds	Price per Pound Cents	Value per Acre Dollars
1	0	667	10.9	72.70
2	400	797	12.9	102.81
3	600	837	14.1	118.01
4	800	985	18.5	182.22
5	1000	974	25.4	247.39
6	1500	1128	25.1	283.12

completed in all the Southern Maryland counties is shown in Tables III & IV, which speak for themselves.

Maryland Tobacco growers have never had such an opportunity to realize a profitable income from tobacco growing as now. Their Experiment Station has developed information on soil types, varieties, cultural practice, fertilization, and proper handling and marketing of the crop. The Extension Service is continually reminding farmers of the best practices and is endeavoring to carry direct to the farmers the most practicable information obtainable.

(*Turn to page* 26)

Table III—Summary—RATE OF APPLICATION TESTS
(11 Tests on 11 Farms)—1926-1931

Plot No.	Rate per Acre Pounds	Yield per Acre Pounds	Price per Pound Cents	Value per Acre Dollars
1	0	873	24.8	216.50
2	200	905	25.9	234.39
3	400	973	28.2	274.38
4	600	1002	28	280.56
5	800	1048	29.2	306.01
6	1000	1068	33.4	356.71

Table IV—Summary—POTASH VARIATION TESTS
(17 Tests on 17 Farms)—(1928-1931)

Plot No.	Fertilizer Analysis	Yield per Acre Pounds	Price per Pound Cents	Value per Acre Dollars
1	4-8-0	898	21.2	190.37
2	4-8-4	965	22.8	220.02
3	4-8-8	999	25	249.75
4	4-8-12	1022	26.2	267.76
5	4-8-16	1063	26.7	283.82
6	4-8-20	1051	25.3	265.90

Field demonstration ready for harvesting on the farm of Joseph S. Burch, Port Tobacco, Maryland. Left, fertilized with 4-8-16. Right, with 4-8-20. Note the smoothness of leaf.

As a result of the years of research by the Experiment Station and the carefully conducted field tests by the County Agents, recommendations for practically all local needs of the tobacco crop have been decided on as follows:

manure or manure and legumes in the rotation are used, in which cases the 2-12-8 and the 0-12-10, respectively, are preferred.

If a soil is suited to tobacco and these recommendations are carefully

FERTILIZER RECOMMENDATIONS FOR MARYLAND TOBACCO

Without either manure or legumes in the rotation and on rested land	4-8-12*
With both manure and legumes in the rotation	0-12-10*
With manure in the rotation	2-12-8*
With legumes in the rotation	2-8-10*
For tobacco seed-beds	6-6-8*

*** All Potash from Sulphate of Potash**

These recommendations have been made flexible enough to fit prevailing practices as to rotations on typical tobacco soils. Generally speaking, the 4-8-12 at 1,000 pounds per acre on rested land without manure or legumes should be satisfactory. Exceptions to this would be for conditions where followed, leaf of better texture, brighter color, and better burning quality will be grown. Such leaf commands better price per pound and, as Captain Neale pointed out to Phillip Trueman more than 300 years ago, tobacco truly becomes the "Gold of the Province of Maryland."

Soil Survey Map Key To Land-Use Problem

A possible key to the solution of the land-utilization problem hangs on the wall of an office of the United States Department of Agriculture in Washington. It is a large map of the country in 250 color patterns, each representing a soil type.

Like individual breeds of cattle, the soil scientists say, each soil type has definite characteristics, needs, and possibilities. Every soil is most fertile for certain plants. Some are most fertile for pine trees, others for grasses, some for crops, and so on. To be made productive for cultivated plants, certain soils need lime, or potash, or irrigation, or terracing, etc.

Soil scientists of the Department have classified and mapped the soils of about one-half of the arable portion of the United States in the last 35 years. With the aid of field and laboratory tests and making use of actual experience gained by farmers, ranchers, and foresters, the character of each is established.

The large many-colored map has recently been assembled from all the information thus far available. This map is on a scale of 1 inch to 40 miles. Although necessarily very general, it gives the location of groups of similar soils shown in detail on the county soil maps published on the much larger scale of 1 inch to the mile. This large map of the country does not furnish the detailed data necessary in comparing one farm with another, but it does allow important regional comparisons. It furnishes the best summary of the soil resources in this or any other country.

Pastures — Irrigated *and* Fertilized

By R. E. Stephenson

Oregon State College

FIFTY-FIVE per cent of the land area of the country is devoted to grazing. On the average the quality is poor and grazing stock are only half fed for a large portion of the season. Considering the entire country, nine acres are required to support an animal.

Fifty per cent of the grazing area is arid or semi-arid, where lack of water permits such sparse growth of grass that 24 acres are needed for each animal unit. The average for the humid section is in the neighborhood of four acres, whereas the better humid pastures support an animal on two and one-half acres.

Compared to these general conditions the most select irrigated Ladino clover pastures in Oregon on fertile soils carry four mature animals per acre. This is 16 times the average or nearly eight times the carrying capacity of the better pastures of the improved lands of the humid sections. Furthermore the irrigated pastures on fertile soil add about one month to the grazing season because of earlier and later grazing.

Great Asset to Dairymen

The dairy farmer is best situated to make pastures profitable. The dairyman can advantageously use every available means to increase pasture production. Records secured by Arthur King show that dairymen by the help of irrigated pastures have produced butterfat at an average annual cost of 16 cents a pound, this, in a section in Oregon where the annual rainfall averages 42 inches. Water is abundant at times, but is poorly distributed through the grazing period. There is very little rain from June till September. During this period irrigation has paid good profits wherever tried.

Grass responds readily to irrigation. The shallow roots soon exhaust the surface of its moisture, and growth stops. Any period of two weeks without two inches of rain is a drouth for grass. Those who irrigate apply two or three inches of water every two weeks through the dry part of the summer. . Recently a farm owner described pasture irrigation as "the greatest thing that ever happened to the Willamette Valley" in Oregon.

It is probably safe to predict that every dairyman in the country where summer drouths are at all common can profitably irrigate provided water is easily obtainable. Some of the best bluegrass pastures of the Midwest and East are dry and parched for a long period of the summer. During this time a drop in the milk flow is nearly unavoidable even with the best supplemental feeding. With good irrigated grass, production is held pretty uniform through the whole summer.

Under normal conditions the peak of pasture growth is about June. Recent studies in Connecticut show that 68 per cent of the total yield is grown before July 15, and only 32 per cent during the three or more months which follow. This indicates pastures with only 50 per cent carrying capacity during the last half compared with the first half of the season. The quality as well as quantity is very poor as the grass dries up. The use of water levels production to a uniform

rate for the whole summer.

Fertility as well as water is needed to produce grass. The stimulation of big yields with water can only exhaust the soil more rapidly unless fertilizer is used. The milk produced by two good cows through one grazing season removes fertility equivalent to that supplied in a 100-pound bag of good fertilizer. Four cows grazed on an acre remove the equivalent of two bags of fertilizer. Grazing is not hard on land. In fact the use of land for grazing makes soil building easy, if fertilizer is used.

Fertilization Without Water

The German or Hohenheim system of pasture management depends upon liberal fertilization without the aid of irrigation water to supplement an erratic rainfall. This system involves the use of limestone, (about a ton per acre) where needed to correct acidity, and a liberal dressing (1,000 pounds an acre) of mineral fertilizer rich in phosphate and potash. In addition a nitrogen fertilizer is applied about three times during the season. The first application of 150 pounds of nitrate of soda, or the equivalent of sulfate of ammonia, is made in March or April. Another application follows in June, and the third about August. The latter applications may be a little lighter than the first.

The Hohenheim system where tried in this country has doubled the carrying capacity of good pastures. Reports indicate that where this system is used one to one and one-half acres may feed a mature cow well through the grazing season. But the Oregon system (supplementing natural rainfall with irrigation water) enables the dairyman to carry two to four cows an acre and have them well fed. Thus fertilizer without supplemental water in humid sections doubles the carrying capacity. When the water is supplied the carrying capacity is more than doubled again. The cost of watering by irrigation is seldom more than the cost of fertilizing. Where one is profitable, both are at least twice as profitable. Records show that cows have been well fed on irrigated grass at a cost of less than 5 cents a day per head.

Fertility is half the story and water is the other half. Neither can be overlooked without reducing the effectiveness of the other. Observers report that after the third year of watering, if fertilizers are not used, the production of grass takes a decided drop. By controlling moisture, fertilizers are made effective and profitable. Furthermore they are safe to use in amounts impossible under the menace of drouth.

Data from the Connecticut station (without irrigation) indicate that when moderate amounts of fertilizer are used, better returns are obtained when the entire amount is applied early in the spring. Nitrogen, part from sulfate of ammonia and part from nitrate of soda, was used in amounts equivalent to 400 pounds of nitrate an acre. Half applied in April and half in July produced smaller yields than when all was applied in April. Lack of moisture undoubtedly reduced the effectiveness of late fertilizing. The average production of grass for five years was doubled by minerals alone (2 tons of lime, 1,000 pounds 16 per cent superphosphate and 200 pounds of muriate of potash in five years). The increase was much greater in favorable seasons. The importance of water is indicated by comparing two years. In 1928 the rainfall in July and August was 50 per cent above the average. During that year more than 49 per cent of the growth of grass occurred after July 15. In 1930, August and September were unusually dry. During that season only 16 per cent of the yield of grass was produced after July 15. As an average for the whole period the growth of grass for one month, May 15 to June 15, was nearly equal the entire growth produced after July 15, covering three months or more. One

may fairly hear the stunted grass crying for water.

The area of land devoted to crops for stock feed is about one-fourth that used for grazing. Yet the sustenance of animals is about equally divided between grass and dry feeds. Two and one-third acres of feed-producing land are required for each animal unit. These data indicate that grass land produces less feed than cropped land. This apparent result is due to the large area of poor land used for pasture.

Careful studies in Pennsylvania indicate that when good soil is used, pasture yields slightly more dry matter and appreciably more digestible protein than cultivated crops grown in rotation. The labor of producing an acre of cultivated crops averaged 28 times as great as that to produce an acre of grass. To produce a ton of digestible protein in cultivated crops cost in labor 63 times as much as when produced from pasture. Economy dictates therefore that as much stock feed as possible should be produced in the form of grass.

Pasture has been described as "the most neglected crop." But sentiment, based upon established facts, is rapidly changing. The conclusion is justified, that "no land is too valuable to become profitable under grass," especially on the dairy farm. The more valuable the land, the more important it becomes to push yields to the maximum with fertilizers, water, and good management. Dairymen have reported net returns of $35 to $45 an acre from grass. How many cultivated crops yield as much even under favorable conditions!

The Inquiring Mind

(*From page* 14)

soils, chief needs of New England agriculture, tendencies in station work, preventions in plant experimentation, after-effects of certain phosphates on limed and unlimed soil, alfalfa and its culture, cover crops, fertilizers and cover crops for fruits and vegetables, the potash shortage, humus content of soil, farming the air, the relationship of the chemistry of soils and fertilizers to the growth of nursery stock, fertilizers for florists, air-nitrogen fertilizers, etc.

In the interval from December 1912 to December 1931 he published for the American Agricultural Chemical Company 60 or more bulletins, circulars, and booklets among which were: "How to Get the Most out of Fertilizers;" "Crops That Pay (Illustrated);" "Citrus Culture in California;" "Citrus Culture in Florida;" and a service bureau news letter. In 1932 and 1933 his series of articles on "Some Mysteries of the Soil" and "The Care of the Lawn" in the columns of the *Rural New Yorker* were received favorably and gave the farm readers much information of an interesting and practical character. The new series begun in that paper in October 1934 has again attracted wide attention.

Evidently he has kept busy all of the time and has considered "idleness the rust of the mind" and believed that to beget esteem, one must benefit others. That, he certainly has done for the farmers of Rhode Island and of many other States, thus earning and deserving their approbation and gratitude and building up a national reputation that will endure.

Native of Massachusetts

Homer J. Wheeler was born at Bolton, Massachusetts, September 2, 1861, the son of Jesse B. and Martha Ann Sykes Wheeler. He was reared on the farm and obtained his early educa-

tion in the district schools. In 1883 he received the B.S. degree from the Massachusetts Agricultural College and Boston University, and in 1899 the Ph.D. degree from the University of Goettingen, Germany. In 1911 Brown University conferred upon him the degree of Doctor of Science. He is an ex-President of the Association of Official Agricultural Chemists and of the American Society of Agronomy, and is a member of Alpha Sigma Phi.

From 1883 to 1887 he was assistant chemist of the Massachusetts Agricultural Experiment Station, and from 1889 to 1907 chief chemist of the Rhode Island Experiment Station. He served as Professor of Geology at Rhode Island State College, 1891 to 1902; Professor of Agricultural Chemistry, 1902 to 1910; acting President, 1902-1903; and Director, Rhode Island Experiment Station, 1900 to 1912. In the latter year he became chief agronomist of the American Agricultural Chemical Company, New York City, a position he held until 1932, when on account of advancing years he retired on a part-time basis. On May 15, 1891, he was married to Frieda H. F. Ruprecht of Germany. They have three sons.

General Knowledge Necessary

Students and research workers will find in Dr. Wheeler's notable book "Manures and Fertilizers" many interesting and instructional conclusions based on the experiments he conducted at the Rhode Island Station.

As a result of his long experience he advised that the person examining the soil should have a good general knowledge of the region from which it comes. He also should know as completely as possible the previous manurial treatment of the soil and the crops that are to be grown, before attempting to recommend special manurial application. This he deemed necessary because of the long-continued beneficial or injurious effects of previous applications of fertilizers, dependent upon the kinds employed, and because of the widely varying requirements of the different varieties of plants.

Experimental work on individual farms in Rhode Island was begun by the Experiment Station in 1890. In that year 11 one-acre fields in as many sections of the State were employed. The idea was to test the relative efficiency, for Indian corn, of nitrogen in nitrate of soda, in sulphate of ammonia, and in dried blood; and also to ascertain the relative lack, in the respective soils, of nitrogen, potash, and phosphoric acid. The results were published in Bulletin No. 139. Extensive experiments in 1892 and 1893 established the fact that the soil on the farm of the Experiment Station at Kingston was greatly in need of lime. The general need of lime was determined in 1896 by experiments conducted on the higher part of the college farm at Kingston and on 10 farms in various parts of the State. Such investigations were conducted in 1898 and 1899 and from 1902 until 1911. Results were published by Dr. Wheeler in Bulletin No. 149 of January 1912.

Value of Work Wide-spread

The experimental work of Dr. Wheeler and an assistant in the use of lime on farm soils brought out facts of considerable interest and value. He found that the addition of carbonate of lime to soils often increases their power to hold potash, ammonia, and other bases, either by chemical or physical means, or perhaps both. He found, too, that liming acid soil lessened the relative amount of weeds, chiefly common sorrel, and increased in a marked manner the growth of timothy, orchard grass, awnless brome-grass, and clover. The increased growth of meadow oat grass, brought about by liming, was less marked than that of the grasses just mentioned. Successive applications of nitrate of soda seemed to lessen the acidity of soils by virtue of

the soda left behind after the utilization of the nitric acid by the plant, while the tendency of sulphate of ammonia upon unlimed soil was just the reverse, making the conditions for the growth of sorrel even more favorable than they would otherwise have been.

There can be no question that the analytical work of Dr. Wheeler and his associates relative to the chemical composition of commercial fertilizers and feeding stuffs offered for sale in Rhode Island was of inestimable value to farmers. As already mentioned he was influential in securing laws for the inspection of those commodities, which proved highly satisfactory. His work in many other lines of agricultural activity has proved of equal benefit.

Versatility Is Marked

The versatility of Dr. Wheeler and the remarkable way in which he has been able to interest himself in new subjects, in new environments, are well evidenced by the work he has done in relation to citrus fruit culture in California and Florida since resigning from the Rhode Island Experiment Station. He has published two instructive booklets which indicate much study and a clear understanding of the citrus fruit growing industry in all of its phases. In them he even gives much useful information regarding the insects and diseases which prey on the orange and other citrus fruits. Other numerous circulars and bulletins written in his new sphere of work give practical advice on the better methods of producing other fruit, farm and truck crops, in the States mentioned.

Concerning the inception of the culture of citrus fruits in America, Dr. Wheeler gives the credit to the Spaniards. He says that in 1769 the Franciscan Fathers led by Junipero Serra, leaving lower California and moving northward, founded the Mission of San Diego. They taught the Indians not only a religion, but the arts of peace, especially agriculture. Vineyards and orchards were set out, traces of which may still be seen, and various sub-tropical fruits were grown. The San Gabriel Mission near Los Angeles was among the most flourishing, and here was planted in 1805 the first large orange grove in the present State of California. This covered six acres and numbered about 400 trees, a few of which still bore fruit 80 years later.

Further, he states that the Washington Navel is particularly adapted to California, and its trademark "the navel end" and absence of seeds give it special advantages, since it cannot be grown successfully in Florida because of developing a thick peel, much rag, and high acidity. The navel, sometimes called the "King" of oranges, is now gradually yielding its title to the former "Queen"—the California Valencia.

Keep Orchard Trees Healthy

Keeping orchard trees fully clad with healthy leaves is, by Dr. Wheeler, considered of vital importance. He says that the process of assimilation, or the formation of sugar, starches, and proteins in the leaves, continues as long as leaves remain green. This necessitates a constant supply of available mineral substances in the soil. As these mineral substances in soluble and readily available form are not present in most soils in sufficient quantities, and especially in sandy soils, the frequent and regular application of suitable fertilizers becomes imperative. And, regarding the feeding of all kinds of farm, garden, and orchard plants, he advises that the important principle to be borne in mind is that *there must be present in the soil during the entire growing season a sufficient amount of all of the necessary elements, in an immediately available form, to meet the fullest requirements of the plant.* Only fertilizers which are so compounded as to furnish all of the lacking plant-food elements in the necessary forms throughout the en-

tire growing season can be expected to give the best results.

One wonders how Dr. Wheeler has managed to retain sufficient vitality, at his time of life, to interest himself so keenly in the subjects to which he has so long and actively directed his attention; but we fancy that his early life on a farm, and the fishing, hunting, and golfing he has done since for exercise and recreation, have conserved his good physical condition and alertness of mind. To his beloved wife also must be given much of the credit for "keeping him in order" and comfortable in their ideal home at Upper Montclair, New Jersey. Here, we hope, they may enjoy together peace, contentment, health, and happiness for many more years to come.

Hearts and Hopes

(*From page 6*)

nights amid the terrifyinig rockets of the Great War, patient and pitiful mine disasters, wrecks and rescues at sea, men and women on the brink of self-inflicted death through tragedies seemingly too heavy for their soul's resistance. Yet after all, the simpler incidents which weave our daily ordinary lives seem closer to the usual aspects of the winter holidays.

DURING the four years or more in which we have missed some of the customary lilt and dash of Christmas and the enthusiasm and hope of the dawning year, has there not been more constant, steady, devoted—albeit blundering—progress ahead toward a goal which will bring us closer to the ultimate meaning of Christmas?

It may be that folks have talked in "parties" and taken divergent views of the identical problem, yet humanity since 1929 has reached higher and searched deeper toward the ideal of brotherhood, so oft repeated and as quickly forgotten.

The Christmas spirit, like all other worth while things, is undergoing transformation, perhaps evolution. It began as a mystic symbol, a hidden Grail; grew into orthodox pageantry; branched out into commercialism and hectic rivalry; and now it seems to be coming out of its Calvary of pain with a new meaning. Probably it now begins to assume its intended hue after all these groping centuries. What has been so long an annual sentiment or spree may become for us a new constitution and a living code.

Piety that counts and goodness that lasts cannot be produced on fear, hunger, and insecurity. A full belly and a decent home are greater inducements to good citizenship than *some* sermons, many laws, and *all* penitentiaries.

AND so this is in reality not a sad time or a time for woebegone predictions and funereal pessimism. This is the dark hour just before the "toppiest" old morning that the country ever greeted.

For every shirker who claims the world owes every man a living there are twenty other willing ones who exclaim: "But the world owes every man the right to *live*." And since it may be too late to wish you Merry Christmas, let us echo the modern spirit by extending to one and all the broader message, "Happy New Era!"

NOT MUCH OF A SMOKE

"Have a cigar?" said the man with the smiling face.

"Don't mind if I do," said his friend. "But what's the occasion? Why this lavish display?"

"Oh, I've got an addition to the family."

"You don't say so? Congratulations!" said the other man, enthusiastically, as he put a match to his cigar. After a few puffs he observed, "About the fifth child, I should say."

"You are charged with being intoxicated," said the judge to a man before him. "What is your name?"

"My name is Angus McPherson MacNabb," replied the prisoner.

"And who bought you the whiskey?" asked the judge.

Father: "My son, I hear you have been most recalcitrant."

Son: "Be yourself, Pop, you've been doing cross-word puzzles again."

Prof. of English: "What is a metaphor?"

Freshman: "To keep cows in."

Smiff: "Bridget, do you know anything concerning my wife's whereabouts?"

Bridget: "Yes, sir, I put them in the wash."

EYE FOR AN EYE

The story is told that when Bishop Candler was riding on a train out West, a big, strapping, rough fellow came in and sat down beside him. Sizing up the Methodist prelate, he exclaimed, "Where in hell have I seen you before?" To which Bishop Candler replied, "I don't know; what part of hell are you from?"

Boy-Friend: "Guess who it is; and if you can't guess in three guesses, I have a right to kiss you."

Helen: "Jack Frost—Father Time—Santa Claus."

GOOD FOR BOTH

The conductor helped the fat lady aboard the street car and remarked, "You ought to take yeast, lady, it would help you to rise."

"Take some yourself, young man, and you'd be better bred," was the reply.

"Wives are sold in the Fiji Islands for $5 each.

"Shame, isn't it?"

"Yep," growled the grouchy bachelor, "more profiteering."

"Jim," said Brown, "what did you call your mother-in-law after you got married?"

"Well," replied Jones, "for the first year I addressed her as 'Say,' and after that we called her 'Grandma.'"

BIG NEWS

for fertilizer users

THE biggest and best news you will find in the new fertilizer price lists is the very small difference in cost between a low-potash fertilizer and a fertilizer well-balanced with plenty of potash. Potash is cheaper today than ever before in history. It is the cheapest unit of plant food the farmer can buy.*

For example, compare 4-8-4 fertilizer with 4-8-8 fertilizer. The 4-8-8 contains 25% more actual plant food, yet it costs the farmer only a fraction more than the 4-8-4. Figured in terms of an acre the extra cost is so small that it will surprise you.

Most farmers have a reduced acreage in their cash crops this year. Can they afford not to be sure their fertilizer contains plenty of potash when potash costs so little?

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When you buy straight potash or potash in mixed fertilizer, it pays to make sure you get genuine **NV** POTASH—*the same potash that has helped American farmers to produce bigger yields and better quality for 50 years.*

N. V. POTASH EXPORT MY., Inc., 19 West 44th St., NEW YORK

* *Except in rare cases.*

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